TOGAF SERIES

TOGAF® 9 Foundation Study Guide

Preparation for the TOGAF 9 Part 1 Examination

2nd Edition

Rachel Harrison

Van Haren Publishing

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TOGAF® 9 Foundation

Study Guide

2nd Edition

Preparation for the TOGAF 9 Part 1 Examination

Prepared by Rachel Harrison of Oxford Brookes University

THE Open GROUP

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Preface

This Document

This document is a Study Guide for TOGAF®9 Foundation. This second edition is based on Version 2 of the TOGAF Certification for People Conformance Requirements, published in December 2011. This edition is aligned to TOGAF Version 9.1, which was published in December 2011.

It gives an overview of every learning objective for the TOGAF 9 Foundation Syllabus and in-depth coverage on preparing and taking the TOGAF 9 Part 1 Examination. It is specifically designed to help individuals prepare for certification.

The audience for this Study Guide is:

- Individuals who require a basic understanding of TOGAF 9
- Professionals who are working in roles associated with an architecture project such as those responsible for planning, execution, development, delivery, and operation
- Architects who are looking for a first introduction to TOGAF 9
- Architects who want to achieve Level 2 certification in a stepwise manner and have not previously qualified as TOGAF 8 Certified

A prior knowledge of enterprise architecture is advantageous but not required. While reading this Study Guide, the reader should also refer to the TOGAF 9 documentation[1] available online at www.opengroup.org/architecture/togaf9-doc/arch and also available in book form.

The Study Guide is structured as shown below. The order of topics corresponds to the learning units of the TOGAF 9 Foundation Syllabus (see Appendix D).

- Chapter 1 (Introduction) provides a brief introduction to TOGAF certification and the TOGAF 9 Part 1 Examination that leads to TOGAF 9 Foundation, as well as how to use this Study Guide.

1 TOGAF Version 9.1 (ISBN is 978 90 8753 679 4 G116), available at www.opengroup.org/bookstore/catalog/g116.htm.

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- Chapter 2 (Basic Concepts) introduces the basic concepts of enterprise architecture and TOGAF. This provides a high-level view of TOGAF, enterprise architecture, architecture frameworks, and the contents of TOGAF.
- Chapter 3 (Core Concepts) describes the core concepts of TOGAF 9.
- Chapter 4 (Key Terminology) introduces the key terminology of TOGAF 9.
- Chapter 5 (Introduction to the ADM) introduces the Architecture Development Method (ADM), the objectives of each phase of the ADM, and how to adapt and scope the ADM for use.
- Chapter 6 (The Enterprise Continuum and Tools) describes the Enterprise Continuum and tools; its purpose, and its constituent parts.
- Chapter 7 (The ADM Phases) describes how each of the ADM phases contributes to the success of enterprise architecture.
- Chapter 8 (ADM Guidelines and Techniques) describes guidelines and techniques provided to support application of the ADM.
- Chapter 9 (Architecture Governance) describes Architecture Governance.
- Chapter 10 (Views, Viewpoints, and Stakeholders) introduces the concepts of views and viewpoints and their role in communicating with stakeholders.
- Chapter 11 (Building Blocks) introduces the concept of building blocks.
- Chapter 12 (ADM Deliverables) describes the key deliverables of the ADM cycle and their purpose.
- Chapter 13 (TOGAF Reference Models) describes the TOGAF reference models, including the Technical Reference Model (TRM) and the Integrated Information Infrastructure Reference Model (III-RM).
- Appendix A (Answers to Test Yourself Questions) provides the answers to the Test Yourself sections provided at the end of each chapter.
- Appendix B (Test Yourself Examination Paper) provides a Test Yourself examination to allow you to assess your knowledge of TOGAF and readiness to take the TOGAF 9 Part 1 Examination.
- Appendix C (Test Yourself Examination Paper Answers) provides the answers to the examination in Appendix B.
- Appendix D (TOGAF 9 Foundation Syllabus) provides the TOGAF 9 Foundation Syllabus.

How to Use this Study Guide

The chapters in this Study Guide are arranged to follow the organization of the TOGAF 9 Foundation Syllabus (see Appendix D) and should be read in

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order. However, you may wish to use this Study Guide during review of topics with which you are already familiar, and it is certainly possible to select topics for review in any order. Where a topic requires further information from a later part in the syllabus, a cross-reference is provided.

Within each chapter are "Key Learning Points" and "Summary" sections that help you to easily identify what you need to know for each topic.

Each chapter has a "Test Yourself" questions section that will help you to test your understanding of the chapter and prepare for the TOGAF 9 Part 1 Examination. The purpose of this is to reinforce key learning points in the chapter. These are multiple-choice format questions where you must identify one correct answer.

Each chapter also has a "Recommended Reading" section that indicates the relevant sections in the TOGAF 9 documentation that can be read to obtain a further understanding of the subject material.

Finally, at the end of this Study Guide is a "Test Yourself" examination paper that you can use to test your readiness to take the official TOGAF 9 Part 1 Examination.

Conventions Used in this Study Guide

The following conventions are used throughout this Study Guide in order to help identify important information and avoid confusion over the intended meaning.

- Ellipsis (…)
  Indicates a continuation; such as an incomplete list of example items, or a continuation from preceding text.
- **Bold**
  Used to highlight specific terms.
- *Italics*
  Used for emphasis. May also refer to other external documents.
- *(Syllabus reference: Unit X, Learning Outcome Y: Statement)*
  Used at the start of a text block to identify the TOGAF 9 Foundation Syllabus learning outcome.

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In addition to typographical conventions, the following conventions are used to highlight segments of text**:**

A Note box is used to highlight useful or interesting information.

A Tip box is used to provide key information that can save you time or that may not be entirely obvious.

About TOGAF

TOGAF®, an Open Group Standard, is a proven enterprise architecture methodology and framework used by the world's leading organizations to improve business efficiency. It is the most prominent and reliable enterprise architecture standard, ensuring consistent standards, methods, and communication among enterprise architecture professionals. Enterprise architecture professionals fluent in TOGAF standards enjoy greater industry credibility, job effectiveness, and career opportunities. TOGAF helps practitioners avoid being locked into proprietary methods, utilize resources more efficiently and effectively, and realize a greater return on investment.

About The Open Group

The Open Group is a global consortium that enables the achievement of business objectives through IT standards. With more than 375 member organizations, The Open Group has a diverse membership that spans all sectors of the IT community – customers, systems and solutions suppliers, tool vendors, integrators, and consultants, as well as academics and researchers – to:

- Capture, understand, and address current and emerging requirements, and establish policies and share best practices
- Facilitate interoperability, develop consensus, and evolve and integrate specifications and open source technologies
- Offer a comprehensive set of services to enhance the operational efficiency of consortia
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References

The following documents are referenced in this Study Guide:

- TOGAF Version 9.1, available online at www.opengroup.org/architecture/togaf9-doc/arch, and also available as TOGAF Version 9.1 "The Book" (ISBN: 978 90 8753 6794) at www.opengroup.org/bookstore/catalog/g116.htm.
- Why Does Enterprise Architecture Matter?, White Paper by Simon Townson, SAP, November 2008 (W076), published by The Open Group (www.opengroup.org/bookstore/catalog/w076.htm).
- Interoperable Enterprise Business Scenario, October 2002 (K022), published by The Open Group (www.opengroup.org/bookstore/catalog/k022.htm)
- ISO/IEC 42010:2007, Systems and Software Engineering – Recommended Practice for Architectural Description of Software-Intensive Systems, Edition 1 (technically identical to ANSI/IEEE Std 1471-2000).
- TOGAF Certification for People: Program Summary Datasheet, February 2009, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_cert_summary.pdf).
- TOGAF 9 Foundation Datasheet, February 2009, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_foundation.pdf).
- TOGAF Certification for People: Certification Policy, February 2009 (X091), published by The Open Group (www.opengroup.org/bookstore/catalog/x091.htm).
- TOGAF Certification for People: Conformance Requirements (Multi-Level), Version 2, December 2011 (X111), published by The Open Group (www.opengroup.org/bookstore/catalog/x111.htm).
- The Clinger-Cohen Act (US Information Technology Management Reform Act 1996).The Sarbanes-Oxley Act (US Public Company Accounting Reform and Investor Protection Act 2002).
- EU Directives on the Award of Public Contracts
- Bill Estrem, "TOGAF to the Rescue" (www.opengroup.org/downloads)

The following web links are referenced in this Study Guide:

- The Open Group TOGAF 9 Certification web site: www.opengroup.org/togaf9/cert
- The TOGAF information web site: www.togaf.info

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Chapter 1

Introduction

1.1 Key Learning Points

This document is a Study Guide for TOGAF® Version 9 for students planning to become certified for TOGAF 9 Foundation. It will familiarize you with all the topics that you need to know in order to pass the TOGAF 9 Part 1 Examination.

It gives an overview of every learning objective for the TOGAF 9 Foundation Syllabus and in-depth coverage on preparing and taking the TOGAF 9 Part 1 Examination. It is specifically designed to help individuals prepare for certification.

This first chapter will familiarize you with the TOGAF 9 certification program and its principles, as well as give you important information about the structure of the TOGAF 9 Part 1 Examination.

The objectives of this chapter are as follows:

- To provide an understanding of TOGAF certification and why you should become certified
- To learn key facts about the TOGAF 9 Part 1 Examination

1.2 The TOGAF Certification for People Program

(Syllabus Reference: Unit 13, Learning Outcome 1: You should be able to briefly explain the TOGAF Certification program, and distinguish between the levels for certification.)

Certification is available to individuals who wish to demonstrate they have attained the required knowledge and understanding of TOGAF Version 9.[2]

2 This second edition of this Study Guide has been updated to cover Version 2 of the TOGAF Certification for People Conformance Requirements, which are aligned to TOGAF Version 9.1.

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There are two levels defined for TOGAF 9 People certification, denoted Level 1 and Level 2, which lead to certification at TOGAF 9 Foundation and TOGAF 9 Certified, respectively. This Study Guide covers the first of these – TOGAF 9 Foundation. Studying for TOGAF 9 Foundation can be used as a learning objective towards achieving TOGAF 9 Certified, as the learning outcomes in TOGAF 9 Foundation are also required in TOGAF 9 Certified.

Table 1: Certification Levels and and Associated Labels

Certification Level	Certification Label
Level 1	TOGAF 9 Foundation
Level 2	TOGAF 9 Certified

Why is TOGAF certification important?
The existence of a certification program for TOGAF provides a strong incentive for organizations to standardize on TOGAF as the open method for enterprise architecture, and so avoid lock-in to proprietary methods. It is an important step in making enterprise architecture a well-recognized discipline, and in introducing rigor into the procurement of tools and services for enterprise architecture.

The two certification levels are summarized in Figure 1 and Figure 2. Figure 1 shows the relationship between Level 1 and Level 2. Level 2 (TOGAF 9 Certified) is a superset of the requirements for Level 1 (TOGAF 9 Foundation).[3]

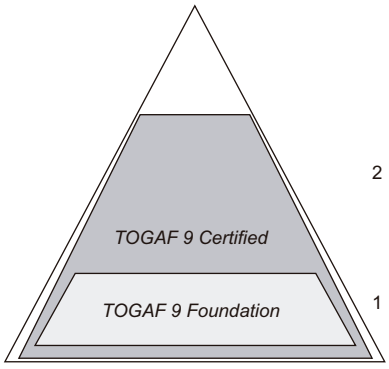

Figure 1: TOGAF 9 Certification Program Overview

3 The gap at the top of the pyramid is to signify that additional certification levels may be added in the future.

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The Open Group also provides a certification path direct to Level 2 (TOGAF 9 Certified) for individuals who have previously achieved the TOGAF 8 Certified qualification. This is known as the bridging option and is illustrated in Figure 2.

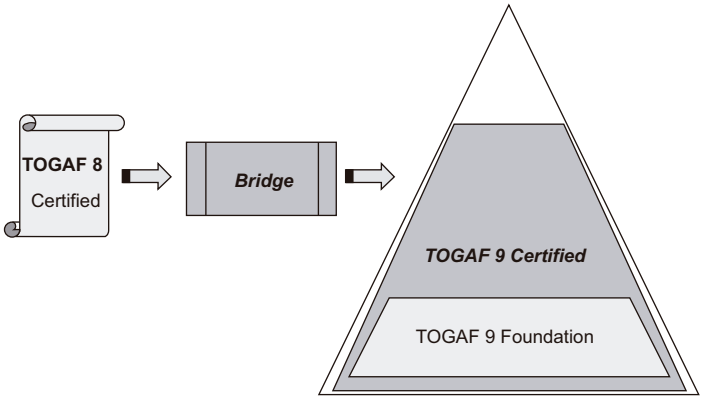

Figure 2: Bridging TOGAF 8 to TOGAF 9

1.2.1 Certification Document Structure

The documents available to support the program are as shown in Figure 3.

Program description documents, such as this Study Guide, are intended for an end-user audience including those interested in becoming certified. The Program definition documents are intended for trainers, examination developers, and the Certification Authority. All these documents are available from The Open Group web site.[4]

Why become certified?

Becoming certified demonstrates clearly to employers and peers your commitment to enterprise architecture as a discipline. In particular, it demonstrates that you possess a body of core knowledge about TOGAF as an open, industry standard framework and method for enterprise architecture. The Open Group publishes the definitive directory of TOGAF Certified individuals, and certified service and product offerings, and issues certificates.

4 For the latest information on examinations, see the TOGAF 9 Certification web site at www.opengroup.org/togaf9/cert.

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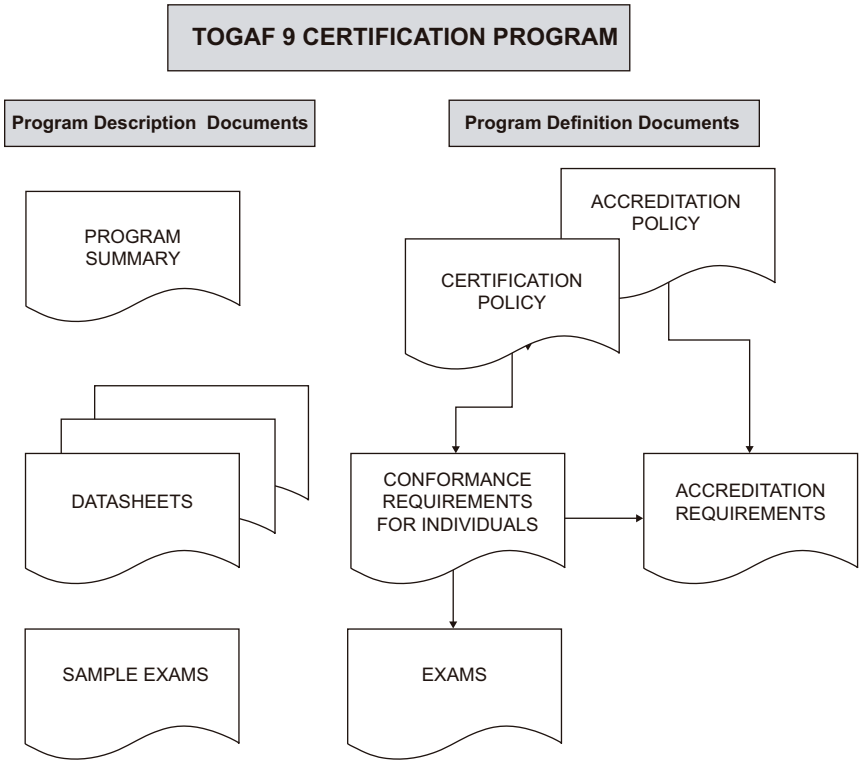

Figure 3: Certification Document Structure

1.2.2 Program Vision and Principles

The vision for the program is to define and promote a market-driven education and certification program to support TOGAF 9. The program has been designed with the following principles in mind:

Table 2: TOGAF Certification Principles

Principle	Certification Aspects
Openness	The program is open to applicants from all countries.
Fairness	Certification is achieved only by passing an examination that is equivalent to that taken by any other candidate.
Market Relevance	The program is structured to meet the needs of the market for conversion from TOGAF 8, as well as for people without prior TOGAF certification, and for certification at two levels. Additional levels may be introduced during the life of the program, as may updated versions of TOGAF.

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Principle	Certification Aspects
Learning Support	Training courses are provided by third parties, according to the needs of the market.
Quality	Training course providers may choose to seek Open Group accreditation for their courses. Accredited courses are listed on The Open Group web site.
Best Practice	The program is designed to follow industry best practice for equivalent certification programs.

1.2.3 TOGAF 9 Foundation

The purpose of certification to TOGAF 9 Level 1, known as TOGAF 9 Foundation, is to provide validation that the candidate has gained an acceptable level of knowledge of the terminology, structure, and basic concepts of TOGAF 9, and understands the core principles of enterprise architecture and TOGAF.

The learning objectives at this level focus on knowledge and comprehension.

Individuals certified at this level will have demonstrated their understanding of:

- The basic concepts of enterprise architecture and TOGAF
- The core concepts of TOGAF 9
- The key terminology of TOGAF 9
- The ADM cycle and the objectives of each phase, and how to adapt and scope the ADM
- The concept of the Enterprise Continuum; its purpose, and its constituent parts
- How each of the ADM phases contributes to the success of enterprise architecture
- The ADM guidelines and techniques
- How Architecture Governance contributes to the Architecture Development Cycle
- The concepts of views and viewpoints and their role in communicating with stakeholders
- The concept of building blocks
- The key deliverables of the ADM cycle
- The TOGAF reference models
- The TOGAF certification program

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Examination

Certification for TOGAF 9 Foundation is achieved by passing the TOGAF 9 Part 1 Examination. This is a multiple-choice examination with 40 questions.[5]

What is the relationship between TOGAF 9 Foundation and TOGAF 9 Certified?
The learning outcomes for TOGAF 9 Foundation are a subset of those for TOGAF 9 Certified. Candidates are able to choose whether they wish to become certified in a stepwise manner by starting with TOGAF 9 Foundation and then at a later date TOGAF 9 Certified, or alternately to go direct to TOGAF 9 Certified by taking the combined examination.

1.2.4 The Certification Process

This Study Guide is aimed at preparing you to become certified for TOGAF 9 Foundation. The examination for this level is the TOGAF 9 Part 1 Examination, which comprises 40 multiple-choice questions.

The TOGAF 9 Foundation Syllabus for the examination is contained in Appendix D. Certain topic areas are weighted as more important than others and thus have more questions. The 11 topic areas covered by the examination together with the number of questions per area in the examination follows:

1. Basic Concepts (3 questions)
2. Core Concepts (3 questions)
3. Introduction to the ADM (3 questions)
4. The Enterprise Continuum and Tools (4 questions)
5. ADM Phases (9 questions)
6. ADM Guidelines and Techniques (6 questions)
7. Architecture Governance (4 questions)
8. Architecture Views, Viewpoints, and Stakeholders (2 questions)
9. Building Blocks (2 questions)
10. ADM Deliverables (2 questions)
11. TOGAF Reference Models (2 questions)

5 For the latest information on examinations, see the TOGAF 9 Certification web site at www.opengroup.org/togaf9/cert.

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1.2.4.1 Format of the Examination Questions

The examination questions are multiple-choice questions. These are very similar in format to the Test Yourself questions included in each chapter. Note that the exact format for display is test center-specific and will be made clear on the screens when taking the examination.

Exam Tip

Please read each question carefully before reading the answer options. Be aware that some questions may seem to have more than one right answer, but you are to look for the one that makes the most sense and is the most correct.

1.2.4.2 What do I need to bring with me to take the Examination?

You should consult with the test center regarding the forms of picture ID you are required to bring with you to verify your identification.

1.2.4.3 Can I refer to materials while I take the Examination?

No; it is a closed-book examination.

1.2.4.4 If I fail, how soon can I retake the Examination?

You should consult the current policy on The Open Group web site. At the time of writing, the policy states that individuals who have failed the examination are not allowed to retake the examination within one (1) month of the first sitting.

1.2.5 Preparing for the Examination

You can prepare for the examination by working through this Study Guide section-by-section. A mapping of the sections of this Study Guide to the TOGAF 9 Foundation Syllabus is given in Appendix D. After completing each section, you should answer the Test Yourself questions and read the referenced sections from the TOGAF documentation. Once you have completed all the sections in this Study Guide, you can then attempt the Test Yourself examination paper in Appendix B. This is designed to give a thorough test of your knowledge. If you have completed all the prescribed preparation and can attain a pass mark for the Test Yourself examination paper as described in Appendix C, then it is likely you are ready to sit the examination.

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1.3 Summary

The TOGAF 9 People certification program is a knowledge-based certification program. It has two levels, Level 1 and Level 2, which lead to certification for TOGAF 9 Foundation and TOGAF 9 Certified, respectively.

The topic for this Study Guide is preparation for taking the TOGAF 9 Part 1 Examination that leads to the TOGAF 9 Foundation certification. The examination comprises 40 simple multiple-choice questions to be completed in one hour.[6]

Preparing for the examination includes the following steps:

- You should work through this Study Guide step-by-step.
- At the end of each chapter, you should complete the Test Yourself questions and read the sections of the TOGAF documentation listed under Recommended Reading.
- Once you have completed all the chapters in this Study Guide, you should attempt the Test Yourself examination paper given in Appendix C.
- If you can attain the target score in Appendix D, then you have completed your preparation.

1.4 Test Yourself Questions

Q1: How many certification levels are there in the TOGAF 9 People certification program?

A. 1
B. 2
C. 3
D. 4

Q2: Which one of the following is the entry level certification for an individual?

A. TOGAF 9 Certified
B. TOGAF 9 Foundation
C. TOGAF 9 Professional
D. TOGAF 9 Architect

6 Additional time is allowed for candidates for whom English is a second language where the examination is not available in the local language. For further information see the advice to candidates sheet on The Open Group TOGAF 9 Certification web site.

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Q3: Which one of the following describes three principles of the TOGAF 9 People certification program?

A. Integrity, Scalability, Flexibility
B. Objectivity, Robustness, Simplicity
C. Openness, Fairness, Quality
D. Knowledge-based, Valuable, Simplicity
E. All of these

Q4: Which of the following topic areas is not included in the TOGAF 9 Foundation Syllabus?

A. Architecture Governance
B. Basic Concepts
C. Building Blocks
D. Guidelines for adapting the ADM: Iteration and Levels
E. Introduction to the ADM

Q5: All of the following apply to the TOGAF 9 Part 1 Examination, except which statement?

A. Candidates who fail cannot take the examination again within one (1) month.
B. The examination consists of more than 100 questions.
C. The examination has multiple-choice format questions.
D. It is a closed-book examination.

1.5 Recommended Reading

The following are recommended sources of further information for this chapter:

- TOGAF Certification for People: Program Summary Datasheet, February 2009, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_cert_summary.pdf)
- TOGAF 9 Foundation Datasheet, February 2009, published by The Open Group (www.opengroup.org/togaf9/cert/docs/togaf9_foundation.pdf)
- TOGAF Certification for People: Certification Policy, February 2009 (X091), published by The Open Group (www.opengroup.org/bookstore/catalog/x091.htm)

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- TOGAF Certification for People: Conformance Requirements (Multi-Level), to December 2011 (X111), published by The Open Group (www.opengroup.org/bookstore/catalog/x111.htm)
- The Open Group TOGAF 9 Certification web site: www.opengroup.org/togaf9/cert
- The TOGAF information web site: www.togaf.info

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Chapter 2

Basic Concepts

2.1 Key Learning Points

This chapter will familiarize you with the fundamentals that you need to know to pass the TOGAF 9 Part 1 Examination. The objectives of this chapter are as follows:

- To provide an introduction to the basic concepts of enterprise architecture and TOGAF, including providing a high-level view of TOGAF, enterprise architecture, architecture frameworks, and the contents of TOGAF 9

Key Points Explained

This chapter will help you to answer the following questions:

- What is TOGAF?
- What is an enterprise?
- What is enterprise architecture?
- Why do I need enterprise architecture? What are the business benefits?
- What is "architecture" in the context of TOGAF?
- What is an architecture framework?
- Why do I need a framework for enterprise architecture?
- Why is TOGAF suitable as a framework for enterprise architecture?
- What does TOGAF contain?
- What are the different types of architecture that TOGAF deals with?

2.2 Introduction to TOGAF 9

2.2.1 What is TOGAF?

(Syllabus Reference: Unit 1, Learning Outcome 7: You should be able to briefly explain what TOGAF is.)

TOGAF is an architecture framework – The Open Group Architecture Framework. TOGAF is a tool for assisting in the acceptance, production, use, and maintenance of enterprise architectures. It is based on an iterative

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process model supported by best practices and a re-usable set of existing architectural assets.

TOGAF is developed and maintained by The Open Group Architecture Forum. The first version of TOGAF, developed in 1995, was based on the US Department of Defense Technical Architecture Framework for Information Management (TAFIM). Starting from this sound foundation, The Open Group Architecture Forum has developed successive versions of TOGAF at regular intervals and published each one on The Open Group public web site.

This document covers TOGAF Version 9.1, referred to as "TOGAF 9" within the text of this document. TOGAF 9.1 is a maintenance update and was published in December 2011. It supersedes the original TOGAF 9 that was published in January 2009.

TOGAF 9 can be used for developing a broad range of different enterprise architectures. TOGAF complements, and can be used in conjunction with, other frameworks that are more focused on specific deliverables for particular vertical sectors such as Government, Telecommunications, Manufacturing, Defense, and Finance. The key to TOGAF is the method – the TOGAF Architecture Development Method (ADM) – for developing an enterprise architecture that addresses business needs.

When appropriate, this Study Guide contains references to sections within TOGAF, which are referred to as "the TOGAF document". The references are intended to be functional for the web version and printed version of the document. Therefore, the format of the reference number contains both the Part and the Chapter reference, but not the page references since they exist only in the printed book.

2.2.2 Structure of the TOGAF Document

(Syllabus Reference: Unit 1, Learning Outcome 6: You should be able to describe the structure of TOGAF, and briefly explain the contents of each of the parts.)

Table 3 summarizes the parts of the TOGAF document.

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Table 3: Structure of the TOGAF Document

TOGAF Part	Summary
Part I: Introduction	This part provides a high-level introduction to the key concepts of enterprise architecture and, in particular, to the TOGAF approach. It contains the definitions of terms used throughout TOGAF and release notes detailing the changes between this version and the previous version of TOGAF.
Part II: Architecture Development Method (ADM)	This part is the core of TOGAF. It describes the TOGAF Architecture Development Method (ADM) – a step-by-step approach to developing an enterprise architecture.
Part III: ADM Guidelines and Techniques	This part contains a collection of guidelines and techniques available for use in applying the ADM.
Part IV: Architecture Content Framework	This part describes the TOGAF content framework, including a structured metamodel for architectural artifacts, the use of re-usable Architecture Building Blocks (ABBs), and an overview of typical architecture deliverables.
Part V: Enterprise Continuum and Tools	This part discusses appropriate taxonomies and tools to categorize and store the outputs of architecture activity within an enterprise.
Part VI: TOGAF Reference Models	This part provides two architectural reference models, namely the TOGAF Technical Reference Model (TRM), and the Integrated Information Infrastructure Reference Model (III-RM).
Part VII: Architecture Capability Framework	This part discusses the organization, processes, skills, roles, and responsibilities required to establish and operate an architecture practice within an enterprise.

2.3 What is an Enterprise?

(Syllabus Reference: Unit 1, Learning Outcome 1: You should be able describe what an enterprise is.)

TOGAF defines an "enterprise" as any collection of organizations that has a common set of goals. For example, an enterprise could be a government agency, a whole corporation, a division of a corporation, a single department, or a chain of geographically distant organizations linked together by common ownership.

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The term "enterprise" in the context of "enterprise architecture" can be used to denote both an entire enterprise, encompassing all of its information systems, and a specific domain within the enterprise. In both cases, the architecture crosses multiple systems and multiple functional groups within the enterprise.

Confusion often arises from the evolving nature of the term "enterprise". An extended enterprise frequently includes partners, suppliers, and customers. If the goal is to integrate an extended enterprise, then the enterprise comprises the partners, suppliers, and customers, as well as internal business units.
For example, an organization with an online store that uses an external fulfillment house for dispatching orders would extend its definition of the enterprise in that system to include the fulfillment house.

2.4 What is Architecture in the Context of TOGAF?

(Syllabus Reference: Unit 1, Learning Outcome 8: You should be able to explain what architecture is in the context of TOGAF.)

ISO/IEC 42010:2007[7] defines "architecture" as:

"The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution."

TOGAF embraces but does not strictly adhere to ISO/IEC 42010:2007 terminology. In TOGAF, "architecture" has two meanings depending upon the context:

1. A formal description of a system, or a detailed plan of the system at a component level to guide its implementation
2. The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time

7 ISO/IEC 42010:2007, Systems and Software Engineering – Recommended Practice for Architectural Description of Software-Intensive Systems, Edition 1 (technically identical to ANSI/IEEE Std 1471-2000).

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What is enterprise architecture?

There are many definitions of enterprise architecture. Most focus on structure and organization. Two definitions are given below:

Enterprise architecture is:

1. The organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the firm's operating model. [Source: MIT Center for Information Systems Research]
2. A conceptual blueprint that defines the structure and operation of an organization. The intent of an enterprise architecture is to determine how an organization can most effectively achieve its current and future objectives. [Source: SearchCIO.com]

2.5 Why do I Need Enterprise Architecture?

(Syllabus Reference: Unit 1, Learning Outcome 2: You should be able to explain the purpose of an enterprise architecture.)

The purpose of enterprise architecture is to optimize across the enterprise the often fragmented legacy of processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy. Effective management and exploitation of information through IT is a key factor to business success, and an indispensable means to achieving competitive advantage. An enterprise architecture addresses this need, by providing a strategic context for the evolution of the IT system in response to the constantly changing needs of the business environment.

(Syllabus Reference: Unit 1, Learning Outcome 3: You should be able to list the business benefits of having an enterprise architecture.)

The advantages that result from a good enterprise architecture can bring important business benefits, including:

- A more efficient business operation:
  - Lower business operation costs
  - More agile organization
  - Business capabilities shared across the organization

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  - Lower change management costs
  - More flexible workforce
  - Improved business productivity
- A more efficient IT operation:
  - Lower software development, support, and maintenance costs
  - Increased portability of applications
  - Improved interoperability and easier system and network management
  - Improved ability to address critical enterprise-wide issues, such as security
  - Easier upgrade and exchange of system components
- Better return on existing investment, reduced risk for future investment:
  - Reduced complexity in the business and IT
  - Maximum return on investment in existing business and IT infrastructure
  - The flexibility to make, buy, or out-source business and IT solutions
  - Reduced risk overall in new investments and their costs of ownership
- Faster, simpler, and cheaper procurement:
  - Simpler buying decisions, because the information governing procurement is readily available in a coherent plan
  - Faster procurement process, maximizing procurement speed and flexibility without sacrificing architectural coherence
  - The ability to procure heterogeneous, multi-vendor open systems
  - The ability to secure more economic capabilities

Ultimately, the benefits of enterprise architecture derive from the better planning, earlier visibility, and more informed designs that result when it is introduced. [Source: Simon Townson, Why Does Enterprise Architecture Matter?]

2.6 What is an Architecture Framework?

(Syllabus Reference: Unit 1, Learning Outcome 4: You should be able to define what an architecture framework is.)

An architecture framework is a foundational structure, or set of structures, that can be used for developing a broad range of different architectures. It should describe a method for designing a target state of the enterprise in

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terms of a set of building blocks, and for showing how the building blocks fit together. It should contain a set of tools and provide a common vocabulary. It should also include a list of recommended standards and compliant products that can be used to implement the building blocks.

2.7 Why do I Need a Framework for Enterprise Architecture?

Using an architecture framework will speed up and simplify architecture development, ensure more complete coverage of the designed solution, and make certain that the architecture selected allows for future growth in response to the needs of the business.

Regulatory Drivers for Adoption of Enterprise Architecture

There are a number of laws and regulations that have been drivers for the adoption and use of enterprise architecture in business:

- The Clinger-Cohen Act
  (US Information Technology Management Reform Act 1996)
  The US Information Technology Management Reform Act (Clinger-Cohen Act) is designed to improve the way the US Federal Government acquires and manages IT. It mandates the use of a formal enterprise architecture process for all US federal agencies.
- The Sarbanes-Oxley Act
  (US Public Company Accounting Reform and Investor Protection Act 2002)
  The Sarbanes-Oxley Act was passed in response to a number of major corporate and accounting scandals involving prominent companies in the US (for example, Enron and Worldcom). Under the Act, companies must provide attestation of internal control assessment, including documentation of control procedures related to IT.
- EU Directives on the Award of Public Contracts
  Similarly within the European Union, there are EU Directives that require vendors involved in Public Contracts to show that they are using formal enterprise architecture processes within their businesses when supplying products and services.

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2.8 Why is TOGAF Suitable as a Framework for Enterprise Architecture?

(Syllabus Reference: Unit 1, Learning Outcome 5: You should be able explain why TOGAF is suitable as a framework for enterprise architecture.)

TOGAF has been developed through the collaborative efforts of more than 300 Architecture Forum member companies from some of the world's leading companies and organizations. Using TOGAF results in enterprise architecture that is consistent, reflects the needs of stakeholders, employs best practice, and gives due consideration both to current requirements and to the perceived future needs of the business.

Developing and sustaining an enterprise architecture is a technically complex process which involves many stakeholders and decision processes in the organization. TOGAF plays an important role in standardizing and risk reduction of the architecture development process. TOGAF provides a best practice framework for adding value, and enables the organization to build workable and economic solutions which address their business issues and needs.

2.9 What are the Different Architecture Domains that TOGAF deals with?

(Syllabus Reference: Unit 1, Learning Outcome 9: You should be able to list the different types of architecture that TOGAF deals with.)

TOGAF 9 covers the development of four architecture domains. These are commonly accepted as subsets of an overall enterprise architecture, all of which TOGAF is designed to support. They are as follows:

Table 4: Architecture Domains Supported by TOGAF

Architecture Type	Description
Business Architecture	The business strategy, governance, organization, and key business processes.
Data Architecture	The structure of an organization's logical and physical data assets and data management resources.
Application Architecture	A blueprint for the individual application systems to be deployed, their interactions, and their relationships to the core business processes of the organization.

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Architecture Type	Description
Technology Architecture	The software and hardware capabilities that are required to support the deployment of business, data, and application services. This includes IT infrastructure, middleware, networks, communications, processing, and standards.

2.10 What does TOGAF Contain?

(Syllabus Reference: Unit 1, Learning Outcome 6: You should be able to describe the structure of TOGAF, and briefly explain the contents of each part.)

TOGAF reflects the structure and content of an architecture capability within an enterprise, as shown in Figure 4.

Definition of "Capability"

An ability that an organization, person, or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organization, people, processes, and technology to achieve. For example, marketing, customer contact, or outbound telemarketing.

[Source: TOGAF 9 Part I: Introduction, Chapter 3 (Definitions)]

An **enterprise architecture capability** (or architecture capability) in the context of TOGAF, is the ability for an organization to effectively undertake the activities of an enterprise architecture practice.

Central to TOGAF is the Architecture Development Method (documented in TOGAF 9 Part II: ADM). The architecture capability (documented in TOGAF 9 Part VII: Architecture Capability Framework) operates the method. The method is supported by a number of guidelines and techniques (documented in TOGAF 9 Part III: ADM Guidelines and Techniques). This produces content to be stored in the repository (documented in TOGAF 9 Part IV: Architecture Content Framework), which is classified according to the Enterprise Continuum (documented in TOGAF 9 Part V: Enterprise Continuum and Tools). The repository is initially populated with the TOGAF Reference Models (documented in TOGAF 9 Part VI: TOGAF Reference Models).

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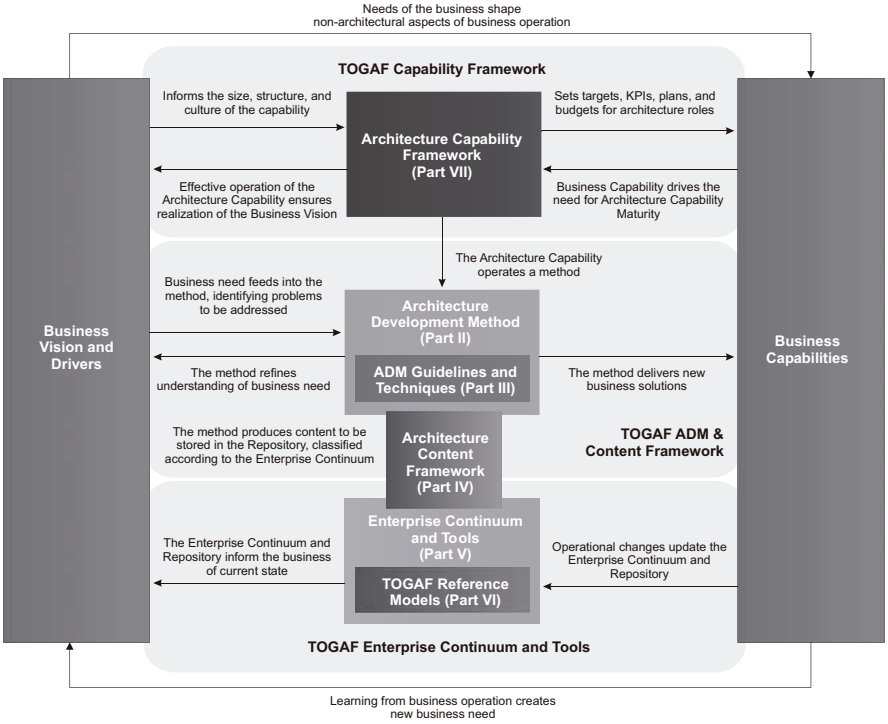

Figure 4: TOGAF Content Overview

These are described in the following sections.

2.10.1 The Architecture Development Method (ADM)

The ADM describes a process for deriving an organization-specific enterprise architecture that addresses business requirements.

The ADM is the major component of TOGAF and provides guidance for architects on a number of levels:

- It provides a number of **architecture development phases** (Business Architecture, Information Systems Architectures, Technology Architecture) in a cycle, as an overall process template for architecture development activity.
- It provides a **narrative of each architecture phase**, describing the phase in terms of objectives, approach, inputs, steps, and outputs. The inputs and outputs sections provide a definition of the architecture content structure and deliverables (a detailed description of the phase inputs and phase outputs is given in the Architecture Content Framework).
- It provides cross-phase summaries that cover requirements management.

See also Chapter 5 and Chapter 7.

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2.10.2 ADM Guidelines and Techniques

ADM Guidelines and Techniques provides a number of guidelines and techniques to support the application of the ADM. The guidelines address adapting the ADM to deal with a number of usage scenarios, including different process styles (e.g., the use of iteration) and also specific specialty architectures (such as security). The techniques support specific tasks within the ADM (such as defining principles, business scenarios, gap analysis, migration planning, risk management, etc.).

See also Chapter 8.

2.10.3 Architecture Content Framework

The **Architecture Content Framework** provides a detailed model of architectural work products, including deliverables, artifacts within deliverables, and the Architecture Building Blocks (ABBs) that deliverables represent.

The details of the Architecture Content Framework are out of scope for TOGAF 9 Foundation, and are covered instead in the Level 2 syllabus.

2.10.4 The Enterprise Continuum

The **Enterprise Continuum** provides a model for structuring a virtual repository and provides methods for classifying architecture and solution artifacts, showing how the different types of artifacts evolve, and how they can be leveraged and re-used. This is based on architectures and solutions (models, patterns, architecture descriptions, etc.) that exist within the enterprise and in the industry at large, and which the enterprise has collected for use in the development of its architectures.

See also Section 3.4 and Chapter 6.

2.10.5 TOGAF Reference Models

TOGAF provides two reference models for possible inclusion in an enterprise's own Enterprise Continuum.

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Table 5: Reference Models Included in the Enterprise Continuum

Reference Model	Description
TOGAF Foundation Architecture Technical Reference Model	The TOGAF Technical Reference Model is an architecture of generic services and functions that provides a foundation on which specific architectures and Architecture Building Blocks (ABBs) can be built.
Integrated Information Infrastructure Reference Model (III-RM)	The Integrated Information Infrastructure Reference Model (III-RM) is based on the TOGAF Foundation Architecture, and is specifically aimed at helping the design of architectures that enable and support the vision of Boundaryless Information Flow.

See also Chapter 13.

2.10.6 The Architecture Capability Framework

The **Architecture Capability Framework** is a set of resources, guidelines, templates, background information, etc. provided to help the architect establish an architecture practice within an organization.

See also Section 3.6, Section 3.7, and Chapter 9.

2.11 Summary

This chapter has introduced the basic concepts of enterprise architecture and TOGAF. This has included answering questions, such as:

- "What is an enterprise?"
  - A collection of organizations that share a common set of goals, such as a government agency, part of a corporation, or a corporation in its entirety.
  - Large corporations may comprise multiple enterprises.
  - An "extended enterprise" can include partners, suppliers, and customers.
- "What is an architecture?"
  - An architecture is defined as "the fundamental organization of something, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution."

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TOGAF is an architecture framework. It enables you to design, evaluate, and build the right architecture for your organization. An architecture framework is a toolkit that can be used for developing a broad range of different architectures.

- It should describe a method to design an information system in terms of a set of building blocks, and show how the building blocks fit together.
- It should contain a set of tools and provide a common vocabulary.
- It should also include a list of recommended standards and compliant products that can be used to implement the building blocks.

The value of a framework is that it provides a practical starting point for an architecture project.

The components of TOGAF 9 are as follows:

- Architecture Development Method (ADM)
- ADM Guidelines and Techniques
- The Architecture Content Framework
- The Enterprise Continuum and Tools
- TOGAF Reference Models
- The Architecture Capability Framework

2.12 Test Yourself Questions

Q1: Which one of the following statements best describes TOGAF?

A. TOGAF is a tool for developing Technology Architectures only.
B. TOGAF is a framework and method for architecture development.
C. TOGAF is a business model.
D. TOGAF is a specific architecture pattern.
E. TOGAF is a method for IT Governance

Q2: Which one of the following best describes why you need a framework for enterprise architecture?

A. Architecture design is complex.
B. Using a framework can speed up the process.
C. Using a framework ensures more complete coverage.
D. A framework provides a set of tools and a common vocabulary.
E. All of these.

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Q3: Which of the following is *not* considered one of the main constituent parts of the TOGAF document?

A. The Architecture Development Method
B. The Enterprise Continuum & Tools
C. The Technical Reference Model
D. The TOGAF Architecture Capability Framework

Q4: Which one of the types of architecture below is *not* commonly accepted as part of the enterprise architecture addressed by TOGAF?

A. Business Architecture
B. Data Architecture
C. Application Architecture
D. Technology Architecture
E. Pattern Architecture

Q5: Which part of the TOGAF document provides a number of architecture development phases, together with narratives for each phase?

A. Part I: Introduction
B. Part II: Architecture Development Method (ADM)
C. Part III: ADM Guidelines and Techniques
D. Part IV: Architecture Content Framework
E. Part V: Enterprise Continuum and Tools

2.13 Recommended Reading

The following are recommended sources of further information for this chapter:

- TOGAF 9 Part I: Introduction, Chapter 1 (Introduction) and Chapter 2 (Core Concepts).
- Why Does Enterprise Architecture Matter?, White Paper by Simon Townson, SAP, November 2008 (W076), published by The Open Group (www.opengroup.org/bookstore/catalog/w076.htm)

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